VOL. XVII. September, 1891. No. 9.

THE
Journal
OF
Nervous and Mental Disease.

Original Articles.

CONSCIOUSNESS FROM A MEDICAL STANDPOINT.

BY SAMUEL WOLFE, M.D.,
of Philadelphia.
Professor of Physiology in the Medico-Chirurgical College.

THE practitioner is frequently called upon to determine the meaning of some modification of consciousness. He is best prepared to do this by the fullest possible understanding of all that pertains to this manifestation of animal life.

Knowledge of a purely psychological character may be of considerable use, but is altogether incomparable to a right understanding of the organic action, upon which the faculty hinges.

As a physiological function, it is now generally regarded as justifiable to locate its seat, its organ, in the cortex of the cerebrum. Some observers have thought themselves warranted in selecting certain distinct portions, as the cortical cells of the frontal lobe, while others believe it to be due to the action of all cells located on the convexity.

However desirable it may seem to be able to point to a particular group of cells, and designate it as the organ of consciousness, any such abstraction would contribute but a small share of what must be regarded in viewing the physiological import of the function. It could avail us but little to know that the glands of the stomach produced a substance of a definite chemical composition, if we had no further knowledge of what could be effected by this fluid, what nervous and vascular relations are necessary to these glands while they perform their work and how such relations are maintained.

If then, we are able to say, in these cerebral cells consciousness is produced, but are ignorant of all associated organic action which enables them thus to act, our knowledge is of small practical use.

Let us, then, view consciousness as a product which, though imponderable like light, heat and electricity, nevertheless always represents a conversion of material elements. Let us look at it as a force, emanating from physical or chemical changes; and, while we forego speculation as to its intrinsic nature and await revelation in regard to the reaction on which its evolution depends, we may possibly usefully occupy ourselves by investigating some determining factors in its production, some of the physiological concomitants with its appearance.

In the investigation of any of the great functions of the body, the usual method is to determine: First, the purpose, and second, the means by which this is fulfilled. If the theme were digestion, we would recognize as purpose the introduction of nutriment into the blood, or to be more restrictive, the presentation of nutrient materials to organs, capable of conducting them into the blood. As means to this end we would examine into the work of all the organs engaged in the trituration, solution and chemical alteration of materials, and investigate the nature, source and mode of production of all the forces and materials engaged in the process.

Let us attempt a similar method with the functions under consideration. The purpose evidently is the recognition of relativity. The very knowledge of existence already implies the relations of time and space. The scope of such recognition extends to what is of the recognizing individual—of the person—of the body—of self, and to what is extraneous or foreign and apart from self. I wish to be understood as not using any of the above terms or any hereafter occurring in this paper, strictly according to their significance or limitation in psychology. With the above broad statement of the *purpose* of consciousness, I will leave its further consideration with a studied intention of remaining as completely as possible without the domain of psychology and within that of physiology.

The consideration of the *means* leads at once to the search for the organ in which the function transpires. As already intimated, the cerebrum is very naturally selected as the portion of the nervous system to credit with this office. All conclusions to be drawn from the phenomena of health and disease, in man and the lower animals, as well as from experimental observation, are indeed confirmatory of this view. But to conclude that the cells of the cineritious cerebral matter have an intrinsic power of manifesting consciousness which is independent of all other parts, is as manifestly wrong as to conclude that the gastric glands can secrete pepsin when completely isolated from all their vital surroundings, even though we would assume the possibility of the gland cells in the one case and the nerve cells in the other, retaining their vitality. I may here take the privilege of quoting from Prof. McKendrick's article on Physiology in the *Encyclopædia Britannica:*

"The functions of the nervous system are so complicated and so closely related to each other, as to make it no easy matter to form a conception of the system, working as a whole. The progress of discovery naturally tends to differentiation, and probably to attach too much importance to one organ, as compared with the others, so that we are in danger of losing sight of the solidarity of the whole nervous system. Probably every nervous action, however minute or evanescent, affects, more or less, the entire system, and thus there may be an under-current of nervous action streaming into and out of the nerve-centres, along with a perpetual series of inter-actions in the centres themselves, contributing to and accounting for the apparent continuity of conscious experience. No one now doubts that consciousness has an anatomical substratum, but the great problem of relation between the two is as far from solution as in the days when little or nothing was known of the physiology of the nervous system. Consciousness has been driven step by step upwards until now it takes refuge in a few thousand nerve-cells, in a portion of the gray matter of the cortex of the brain. The ancients believed that the body participated in the feelings of the mind, and that in a real sense the heart might be torn by contending emotions. As science advanced, consciousness took refuge in the brain, first in the medulla, and lastly in the cortex. But even supposing that we are ultimately able to understand all the phenomena—chemical, physical and physiological—of this intricate ganglionic mechanism, we shall be no nearer a solution of the problem of the connection between the objective and subjective aspects of the phenomena. It is no solution to resolve a statement of the phenomena into mental terms or expressions, and to be content with pure idealism; nor is it any better to resolve all the phenomena of mind into terms describing physical conditions, as in pure materialism. A philosophy recognizing both sets of phenomena, mutually adjusted and ever interacting, may be no explanation; but, at all events, it is unpretentious, recognizes facts and does not delude the mind by offering a solution which is no solution at all. But apart from the ultimate question is the important one whether physiologists are, on the whole, right in relegating sensation or consciousness entirely to the gray matter of the brain. The facts of comparative physiology are against such an exclusive notion, because we cannot deny consciousness to many animals having rudimentary nervous systems. . . . Research in anatomy and physiology, and the observation of disease, have driven physiologists to adopt the view that the brain is the organ of sensation. This is no doubt true in the sense that it ultimately receives all those nervous impressions that result in consciousness. But the parts transmitting the nervous impressions are, in another sense, as much concerned in the production of nervous states as the brain. This view of the matter, put forward by Prof. John Cleland in 1870, has not received from physiologists the attention it deserves. His theory is 'that the consciousness attends from the special seat, so far as there is continuity of impressed condition; that, when an irritation is applied to a nerve extremity in a finger or elsewhere, the impression (or rather, impressed condition) travels, as is generally understood, but exists at least a moment along the whole length of the nerve, and that as soon as there is continuity of the impressed condition from finger to brain, the consciousness is in connexion with the nerve, and is directly aware of the irritation at the nerve extremity.'"

"This view is quite consistent with all the facts of nervous physiology and presents fewer difficulties than the one generally held, which drives consciousness into the recesses of the nerve-cells in the cerebral hemisphere. It appears to keep clear of the prevailing error in the philosophy of modern physiology—that of regarding the body, and even the nervous system, as a vast series of almost independent organs, losing sight of the community of organs and interdependence of parts characteristic of the body of one of the higher animals."

We should, then, recognize as means in the performance of this function, all parts of the nervous system, and, indeed, all parts of the body other than the nervous tissues, since we are conscious of the body as a living apparatus, of which the different parts may be conceived (or, more properly speaking, recognize themselves), but which is also conceived as a whole.

Every living cell within the body may therefore be regarded as an integral part in making up the sum total of consciousness, since the fact is well known that no modification of any part can take place, without impressing consciousness.

An individual in perfect health and at perfect ease is, indeed, not attentive to the fact of even the existence of any particular portion of his body; but that every part is registering its condition, at every moment, is evident when we contemplate that even the most gradual changes in the conduction of living processes of a general nature, such as come about by diminution of oxygen or food substance, or by improper elimination of excrementitious matters, impress themselves, and when reaching a certain degree, beget the consciousness of being in a close atmosphere, of hunger or thirst, of existing conditions which may not suggest a name, but are recognized as dissimilar from those present when all excretion is going normally on. But the physiologist will attribute this to direct impression on the cortical cells, due to a failure in the oxygen or food supply to them directly, or to retention in them of waste and disintegrated matters. When, however, only a portion of the body, however minute, becomes modified and that portion unmistakably remote from these cells, consciousness is also impressed.

In the one case, all the tissues of the organism are affected by a cause which gives rise to a conscious state. In the other, only a minute portion of these tissues are affected. Can we admit that the whole phenomena of consciousness in the one case lies in the functioning of the cerebral cells, as directly determined by their nutrient fluid; and in the other in the functioning of the cerebral cells, as indirectly determined by an impression conducted from a distant part? Is it not more rational to believe all the tissues physiologically affected as having a direct share in the production of the result? Are the cerebral cells, in either case, more essential than the parts with which they are anatomically and physiologically connected?

The advantages accruing to the science as well as to the art of medicine, in the recognition and study of the differentiation of structure and the division of labor, need not be denied. It is practicable to know that the lungs carry on the interchange of oxygen and carbon dioxide between the atmosphere and the blood; that the parotid gland and its congenors secrete the saliva, that the kidneys remove the urea, that muscular fibre produces movement by contraction and so on, but all these facts, if not properly collated with others to which they are related, would form but a fragile basis for an enlightened practice. Just so, while it is not only highly gratifying to the scientist to know that the cortical cells, so to speak, secrete consciousness, but also of great practical advantage to the physician and surgeon, yet to allow these organs to claim investigation alone, to the exclusion of all others, is, in the determination of the significance of either physiological or pathological manifestations affecting consciousness, manifestly illogical. The physician must determine between affections of this function which have a local, and those which have a general, origin.

When the respiration is observed and found abnormal, the intelligent physician does not alone diagnose disease of the lungs. He has learned to discriminate and to properly interpret the altered respiratory movements which belong, in one case, to asphyxia, in another to central nervous disease and in another to pulmonary affections.

It is not to be forgotten that he does also discriminate in affections of consciousness. The failure of the heart, the toxic properties of the blood, the mechanical pressure, are all understood in syncope, coma, apoplexy and so on. But when the heart becomes weak and the patient faints, he is satisfied with explaining the unconsciousness as due to the failure of blood supply to the cerebral cortex, forgetting that all other portions of the body are suffering a like deprivation. He forgets, when he places the patient in a horizontal position, that he thus favors the proper distribution of blood, not to the cerebral cortex only, but to all the other vital organs as well, not excepting even the heart itself. It should be remembered too, and this the writer would regard as the more essential point, that everything tending to the increase of blood supply to the brain is so much gained in the stimulation of the respiratory and cardiac centres, and therefore of the revival of life.

That these are important indications is apparent, when we reflect that consciousness is by no means an essential of life, while the circulatory and respiratory functions are. The true inference then is that in syncope cessation of consciousness is the result of cessation of the metabolic changes which constitute the life processes in all the tissues, owing to the suspension of the circulation, and that the return of the former is simply dependent on the return of the latter; that the cerebral structures are only implicated to the same degree as all the other living tissues.

Where coma, or lesser disturbances of consciousness result from poisonous substances circulating in the blood, as in uræmia, alcoholism, narcotic poisoning, constant recourse is had to the theory of a "selective action" on the cortical cells. In the light of the position here taken, such an explanation is erroneous. All the tissues may be suffering equally, but since all have a share in the production of consciousness, this manifestation only ceases when all other vital manifestations have nearly come to an end—with the approach of death.

A contrast of the deep coma, continuing for days and weeks, incident to direct effects, such as hemorrhagic extravasation, with the gradually deepening form, ending in death, characteristic of uræmia, affords additional ground for the belief that in the cortical cells we have only the organ concerned in the expression, so to speak; in the secretion, the exosmosis, while the organic basis of consciousness, when viewed in its totality, must embrace all the tissues which, in their living state, are anatomically connected with these cortical cells as a portion of the same living organism, with a special share assigned to the nervous system.

1624 DIAMOND STREET.